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PSYCHOLOGICAL LITERATURE.

I.—NEUROLOGICAL.

Experimental Degenerations Following Unilateral Lesions of the Cortex Cerebri in the Bonnet Monkey (Macacus Sinicus). E. LINDON MELLUS, M. D. Proc. Royal Soc., LVIII, pp. 206-14. 1895.

Physiologically, by direct stimulation of the cortex, it is impossible to do more than follow out a few of the main lines of relation between the cortex and the muscular system. By cutting away the cortex and applying the stimulus to the fibres of the corona radiata of internal capsule or to the columns of the medulla or spinal cord, this method has also succeeded in tracing, after a fashion, the paths of motor fibres through different levels of the central axis. At best, however, results of this method lack precision. The anatomical method, depending on degenerations following a lesion, especially as now developed by Marchi, has made it possible to follow the course of nerve fibres with great accuracy. The present research has for its object to trace by Marchi's method all the fibres which arise in a small region of the cortex to their destinations in the cerebrum, medulla and spinal cord.

Fourteen successful operations are recorded, of which three are lesions of the hallux centre, four of the thumb centre and seven of four different centres in the facial area. These centres were first located by stimulation, and then a portion of the cortex, about 16 sq. mm., was cut out to its full depth. Each class of experiments is treated by itself in detail with the comparison of the results of each experiment in the class. For these details the reader is referred to the original paper. The more striking general results of the entire series of experiments may be summarized as follows.

From the lesion as a centre, degenerated fibres spray out in all directions to associated regions of the same hemisphere. These decrease quite uniformly in number with the distance from the lesion and do not cover so large a region as might be expected from current ideas regarding association fibres. For the above lesions they are confined to the central convolutions. In harmony with the observation of Bevan Lewis, that the cells of the fourth layer are large in the upper portions of the motor areas and small in those farther down toward the base of the brain, Mellus finds that the fibres that pass down are fine, while those that pass upward from the lesion are coarser. According to the individual lesion, either fine fibres or both fine and coarse fibres pass through the corpus callosum, or posterior commissure, to distribute themselves over an area in the other hemisphere very similar in outline to the area of degenerated fibres on the side of the lesion. To give the course of the degenerated fibres in the internal capsule, which is of

especial importance, I will quote from the author's summary. He says: "All the degenerated pyramidal fibres from the hallux and thumb lesions were found to enter the capsule at or near the posterior extremity, while the corresponding fibres from the facial lesions entered the capsule at or near the anterior extremity, and the former were displaced forward and the latter backward until in the lower levels of the capsule they all found a place in the middle third of the posterior limb. It is also shown that a line can be drawn from the fissure of Sylvius upward, so dividing the motor area into two parts that all the facial lesions from which fibres enter the anterior portion of the capsule would be in the anterior division, and all the hallux and thumb lesions from which fibres enter the posterior portion of the capsule would be in the posterior division. In the movement of the facial fibres backwards between the upper and lower levels of the capsule, they would necessarily, at some level, envelope the genu, which would account for the fact that they have always been described as occupying that position. These results correspond closely with those obtained by Beever and Horsley by direct stimulation of the internal capsule in the same animal. As to the further course of the degenerated fibres, a large part of the fine fibres can be traced into the outer surface of the optic thalamus, and farther down, coarse fibres, which resemble in size and position true pyramidal fibres, pass as far as can be determined into the *substantia nigra*. These fibres going to the *substantia nigra*, moreover, about equal in number those passing down in the pyramids. In three of the facial lesions and in one thumb lesion, no other degeneration can be traced in the internal capsule than the stream of chiefly fine fibres to the thalamus and that of coarse fibres to the *substantia nigra*, no connection being demonstrable between the cortex and the facial nuclei or the motor nuclei in the cord. In all the other experiments, however, these relations are manifest.

A result of immense importance to the subject of bilateral control of the spinal cord by each cerebral hemisphere is clearly demonstrated for the first time in the monkey, though formerly shown to exist in the dog by Muratoff. Sherrington had noticed degenerated fibres in both crossed pyramidal tracts, and advanced the rather clumsy theory that after decussating in the medulla, these fibres recrossed at lower levels of the cord. The fact is that a considerable number of these fibres may remain upon the side of their cerebral origin not only in the anterior, but in the lateral pyramidal tract. Whether these finally cross at their terminations in the cord, as do the fibres of the anterior pyramidal tract, is not stated.

Another peculiar result found in three of the facial lesions is degeneration in the internal capsule of the side opposite to the lesion. All the lesions were made in the left hemisphere, and in these three cases the degeneration in the right capsule varied from one half to fully as much as occurred in the left capsule. The only way this could be accounted for on modern theories of degeneration would seem to be that these fibres crossed in the corpus callosum and passed down in the opposite capsule. As this cannot be shown to occur in the specimens, the fact must be left for the present unexplained.

By the courtesy of Dr. Mellus, the writer has seen the specimens and photographs from them and can testify that the above points are demonstrated in the most precise manner possible. There is every reason to hope that further work along this line which Dr. Mellus is undertaking will continue to yield most important results.

C. F. H.